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Rotary regenerator

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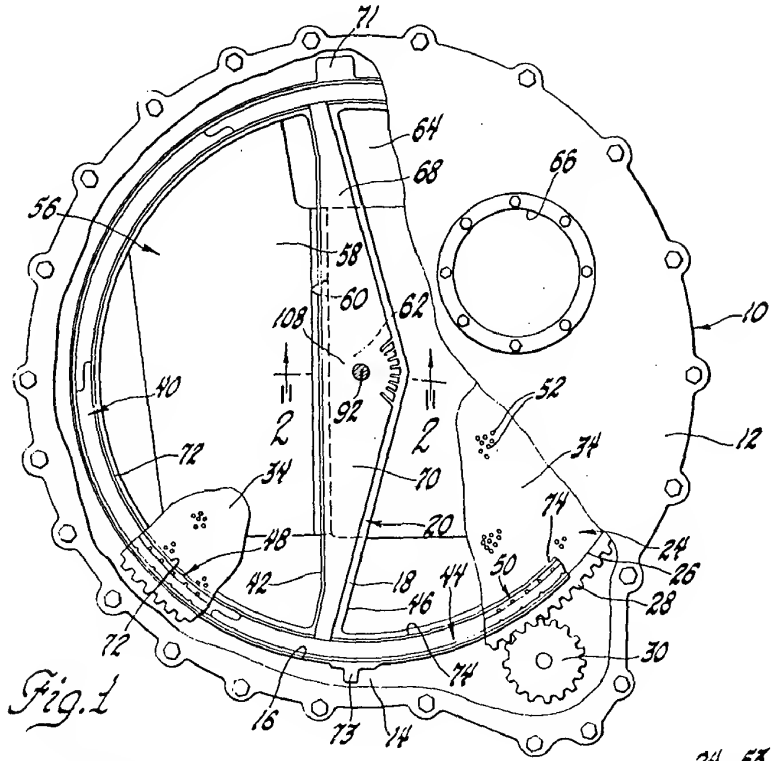


Fig. 1

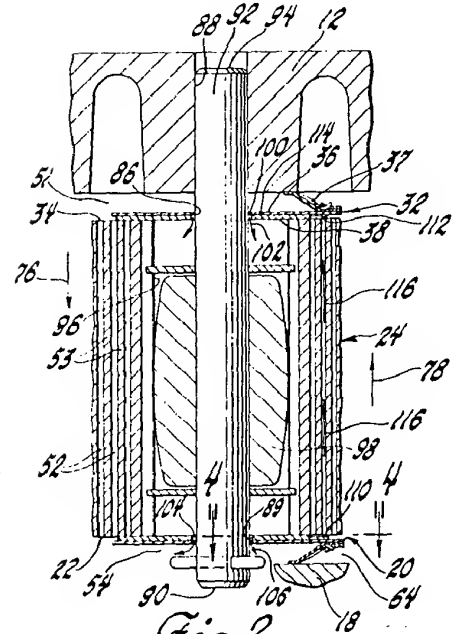


Fig. 2

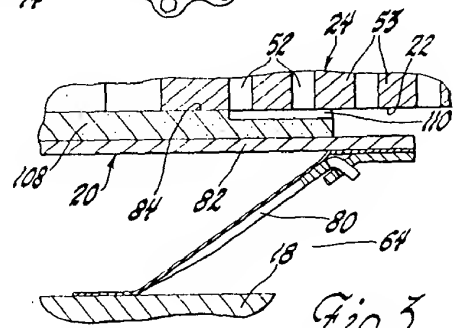


Fig. 3

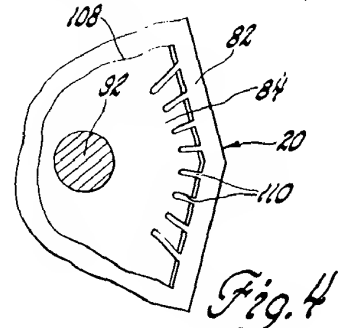


Fig. 4

excessive cooling of the seal wear face 84 can cause it to have an increased friction as the hot face 22 passes thereacross and furthermore can reduce wear resistance of wear face 84. The effect is primarily concentrated in the region of a hub section 108 of the inboard seal wear face 84 as best shown in Figures 1 and 4. Prior attempts to alleviate this problem have included prevention of leakage of cold air into the bore 96 of the matrix disc 24. However, such structure can unduly complicate the hub drive system. Accordingly, the present invention compensates for a leakage of cold air through the bore 96 as shown in Figure 2 and provides a modified seal wear face hub section 108 to provide means for counteracting the effect of cold air flow thereacross. More particularly, the hub section 108 includes a plurality of outwardly formed grooves 110 that extend from the inboard edge of the wear face seal 84 that faces the hot gas flow path to a point immediately adjacent the inner wall of the matrix disc bore 96 as best shown in Figure 2. These grooves are aligned with like grooves 112 formed in a center hub section 114 of the wear face 38. The grooves 112 are located in axial alignment with the grooves 110 on the opposite side of passages 52 in disc 24. The grooves 112 constitute outlets from the passages 52 that are opened to hot gas flow through the passages 110 which define inlets to a hot gas circulation path 116 which is formed closely adjacent the wall of the bore 96 at a point which would otherwise be sealed by the planar extent of both the seal wear face 84 of the inboard cross arm seal assembly 20 and the seal wear face 38 of the outboard cross arm seal assembly 32. The grooves 110, 112 are sized to provide a predetermined flow of hot gas pumped by the pressure differential from the exhaust gas passage 64 to the exhaust opening 66. The rate of hot gas flow through the circulation path 116 as shown in Figure 2 is selected to counteract the cooling effect of the air flow 106 across the center hub section 108 of the seal wear face 84 so that the temperature of the wear face seal 84 will be maintained uniformly within an elevated temperature range of from 1000°F to 1500°F (538°C to 816°C). Yet, the grooves 110, 112 restrict gas flow through circulation path 116 to a level at which the hub section 114 of the outboard cross arm seal assembly will not be subjected to such an excessive temperature rise as to undesirably effect its wear and friction characteristics.

CLAIMS

1. A rotary regenerator comprising: a housing defining an air flow path and a gas flow path for air and gas at different pressure levels, an axial flow matrix with a hub including a center opening, said matrix also having open ended passages extending across the flow paths, said matrix having said open end passages pervious to fluid flow through the paths and including inboard and outboard radial surfaces, spindle means for rotatably supporting said matrix for rotation with respect to said housing, an outboard cross arm seal assembly interposed between the housing means and said outboard radial surface and including an outboard cross arm with a platform and wear surface extending between said flow paths for sealing therebetween, an inboard cross arm seal assembly including an inboard cross arm having a seal platform and a wear surface engageable with said inboard radial surface to seal between the flow paths at the inboard radial surface of the matrix, means including aligned bores in said outboard and inboard seal assemblies for defining an air circulation path for distribution of cold air from the air path to the outboard seal assembly through the center opening in said matrix and for distributing cold air through the matrix and in surrounding relationship to said spindle means, a center hub wear surface region of said inboard cross arm cooled by cooling air flow through one of said aligned bores, and heater means for reheating said center hub wear surface region to counteract the cooling effect of cooling air flow on said center hub wear surface region of said inboard seal assembly thereby to maintain a uniformly elevated temperature across the full planar extent of the inboard cross arm wear surface to optimize the operating temperature thereof during gas turbine engine operation so as to maintain low friction and wear characteristics between said last mentioned seal wear surface and the matrix disc at elevated temperature ranges.
2. A rotary regenerator according to claim 1, in which said heater means includes undercut grooves in the outboard and inboard wear surfaces on the side thereof facing the gas flow path, which direct hot gas from said inboard radial surface through the matrix disc adjacent the central opening therein to the outboard radial surface on the gas side of said matrix disc.
3. A rotary regenerator substantially as hereinbefore particularly described and as shown in Figures 1 to 4 of the accompanying drawings.